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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.
09/340,720	06/29/99	TAKASHIMA	D 0039-7271-25

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EXAMINER

DICKEY, T

ART UNIT

PAPER NUMBER

2826

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DATE MAILED:

08/15/01

Please find below and/or attached an Office communication concerning this application or proceeding.

Commissioner of Patents and Trademarks

Office Action Summary

Application No.

09/340,720

Applicant(s)

TAKASHIMA ET AL.

Examiner

Thomas L Dickey

Art Unit

2826

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☐ Responsive to communication(s) filed on 27 October 1999.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-12 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-12 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on _____ is: a) ☐ approved b) ☐ disapproved by the Examiner.
If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some * c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
- a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO-1449) Paper No(s) 3.
- 4) ☐ Interview Summary (PTO-413) Paper No(s) _____.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other:

Art Unit: 2826

DETAILED ACTION

Oath/Declaration

1. The oath/declaration filed on 06/29/99 is acceptable.

Drawings

2. The formal drawings filed on 06/29/99 are acceptable.

Priority

3. Receipt is acknowledged of papers submitted under 35 U.S.C. 119(a)-(d), which papers have been placed of record in the file.

Information Disclosure Statement

4. The Information Disclosure Statement filed on 06/29/99 has been considered.

Specification

5. The title of the invention is not descriptive. A new title is required that is clearly indicative of the invention to which the claims are directed, such as "MOSFET HAVING HIGH AND LOW DIELECTRIC MATERIALS"

Claim Rejections - 35 USC § 112

6. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

Art Unit: 2826

Claims 1-12 are rejected under 35 U.S.C. 112, first paragraph, as containing subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention.

Regarding claims 1-8 and 10-12, in claim 1 line 16 and claim 10 lines 18 and 20, the phrases "assuming" and "is assumed" render the claims indefinite because it is unclear whether the limitation(s) following the phrases are part of the claimed invention. See MPEP § 2173.05(d).

In claim 9, line 13, the word, "closer" is indefinite as it does not clearly set forth the metes and bounds of the invention. Whether this word modifies "area" or "gate insulation film" is unclear. The claim does not specify what object is closer to the electric flux density, or how "closer" is measured.

In claim 1, line 17, the phrase, "adjacent to said surface layer on a gate electrode side" is indefinite as it does not clearly set forth the metes and bounds of the invention. Whether this phrase modifies "area" or "gate insulation film" is unclear.

In claim 1 line 17 the phrase "a gate electrode side" is indefinite in that it cannot be determined whether it positively recites a side of the previously recited gate (a side) or a side of a new, positively recited, gate electrode (a gate electrode) If the latter, the name of the part should be changed to not be confused with the first gate electrode.

Claim 6 recites the limitation "the predetermined distance" in line 4. There is insufficient antecedent basis for this limitation in the claim.

Correction is required.

Art Unit: 2826

Claim Rejections - 35 USC § 102

7. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless --

(e) the invention was described in a patent granted on an application for patent by another filed in the United States before the invention thereof by the applicant for patent, or on an international application by another who has fulfilled the requirements of paragraphs (1), (2), and (4) of section 371(c) of this title before the invention thereof by the applicant for patent.

Claims 1,2, and 4-9 are rejected under 35 U.S.C. 102(e) as being anticipated by KRIVO-KAPIC et al. (6,100,598).

Krivokapic et al. discloses a MOSFET HAVING HIGH AND LOW DIELECTRIC MATERIALS wherein a channel (no part #) of a first conductive type formed on a surface layer of a semiconductor substrate 12, a source 34 and a drain 34 of a second conductive type formed on both sides of the channel, a gate insulation film 210 with a first relative permittivity formed at least on the channel directly or through buffer insulation film 40, a gate electrode 220 formed on the gate insulation film 210, a side insulation film 194 (alternatively 196) formed at least on a side of the gate insulation film and having a second relative permittivity which is smaller than the first relative permittivity, wherein an area of the gate insulation film 210 adjacent to the interface between the gate insulation film 210 and the gate electrode 220 is larger than an area thereof which is adjacent to the interface between the gate insulation film 210 and the channel, wherein the first gate insulation film 210 is a high dielectric film or a ferroelectric film including a composition or an element of one of Ta₂O₅, Sr₂Ta₂O₇, TiO₂, SrTiO₃, BaTiO₃, CaTiO₃, Ba_xSr_{1-x}TiO₃, PbTiO₃, PbZr_xTi_{1-x}O₃, SrBi₂Ta₂O₉, SrBi₂(TaxNbl-x)₂O₉, or Bi₂(TaxNbl-x)₆, namely TiO₂ or SrTiO₃, so that the first permittivity is 20 or more, the width of the gate insulation film

Art Unit: 2826

210 on the channel side is smaller than the width of the gate insulation film on the gate electrode 220 side in a length along a channel width direction of the gate insulation film 220, a sectional shape of the gate insulation film 210 along a direction of the source-drain is one of tapered shape, a trapezoid, a sector, and a stair, namely, a rectangle (i.e. a type of trapezoid) a sectional shape along a direction of the source-drain of the gate insulation film 210 from the gate electrode to a predetermined line (claim reads "the predetermined distance") on the channel side is a rectangle, and the just mentioned sectional shape is one of a tapered shape, a trapezoid, a sector, and a stair, namely, a rectangle (i.e. a type of trapezoid), the buffer insulation film includes one of SiO₂, Si₃N₄, N₂O, TiO₂, SrTiO₃, MgO or CeO₂, namely, SiO₂ or Si₃N₄. Note col. 8, lines 5 and 8, and figure 20 of Krivokapic et al.

Claim Rejections - 35 USC § 103

8. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 3, 10 and 11 are rejected under 35 U.S.C. 103(a) as being unpatentable over KRIVOKAPIC et al. (6,100,598).

With regard to claim 3, Krivokapic et al. discloses all the elements of claim 3 except that area (S1, per claim) of the gate insulation film 210 adjacent to the interface between the gate insulation film 210 and the gate electrode 220 is 1.5 times larger than an area (S2, per claim) thereof which is adjacent to the interface between the gate insulation

Art Unit: 2826

film 210 and the channel. Although Krivokapic et al.'s device does not teach the exact ratio of areas as that claimed by Applicant, the width differences are considered obvious design choices and are not patentable unless unobvious or unexpected results are obtained from these changes. It appears that these changes produce no functional differences and therefore would have been obvious. Note *In re Leshin*, 125 USPQ 416.

With regard to claims 10 and 11, these claims require a first plurality of devices, individual ones of said first plurality of devices described in a manner identical to devices described in claim 1 and also by Krivokapic et al., and a second plurality of devices, individual ones of said second plurality of devices being identical in all but one respect to individual ones of said first plurality of devices, said individual ones of said second plurality of devices likewise described in a manner identical to devices described in claim 1 and also by Krivokapic et al. There is the additional limitation that top/bottom ratios of gate insulation films in single ones of the first plurality of devices be greater than top/bottom ratios of gate insulation films in single ones of the second plurality of devices. As claimed, individual ones of the first and second pluralities are otherwise identical. It is considered that it would have been obvious to a person having skill in the art to reproduce a given plurality of Krivokapic et al.'s MOSFET HAVING HIGH AND LOW DIELECTRIC MATERIALS in order to provide a plurality of devices with lower gate capacitances to thus densely pack a large number (at least two pluralities) of such devices on one chip. Given at least some manufacturing tolerance in top/bottom ratios of gate insulation films in these devices, a first sub-plurality of said given plurality will have larger than average top/bottom ratios of gate insulation films, a second sub-plurality will have smaller than average top/bottom ratios of gate insulation films, and individual ones of the larger than

Art Unit: 2826

average devices will be larger than individual ones of the smaller than average devices. It should be noted that claims 10 and 11 require that the 1st and 2nd pluralities be present but not that they be sorted out or arranged in any way.

Allowable Subject Matter

9. Claim 12 would be allowable if rewritten to overcome the rejection(s) under 35 U.S.C. 112 set forth in this Office action and to include all of the limitations of the base claim and any intervening claims.

Conclusion

10. Papers related to this application may be submitted to Technology Center (TC) 2800 by facsimile transmission. Papers should be faxed to TC 2800 via the TC 2800 Fax center located in Crystal Plaza 4, room 3-C23. The faxing of such papers must conform with the notice published in the Official Gazette, 1096 OG 30 (November 15, 1989). The Group 2826 Fax Center number is (703) 308-7722 and 308-7724. The Group 2800 Fax Center is to be used only for papers related to Group 2800 applications.

Any inquiry concerning this communication or any earlier communication from the Examiner should be directed to Thomas Dickey whose telephone number is **(703) 308-0980**. The Examiner is in the Office generally between the hours of 8:00 AM to 5:00 PM (Eastern Standard Time) Monday through Friday.

Any inquiry of a general nature or relating to the status of this application should be directed to the **Technology Center Receptionists** whose telephone number is **308-0956**.

TLD
08/2001


Minh Loan Tran
Primary Examiner